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MAR 21 1907

Vol. XIII. MARCH, 1907. No. 6

THE AGRICULTURAL STUDENT

COMPARISON OF THE OHIO AND CALIFORNIA QUAIL—H. E. Allen

SOME LESSONS FROM THE WEST—E. Kinney

ALKALI SOILS, THEIR CHARACTER AND RECLAMATION, OCCURRENCE AND FORMATION—L. E. Call

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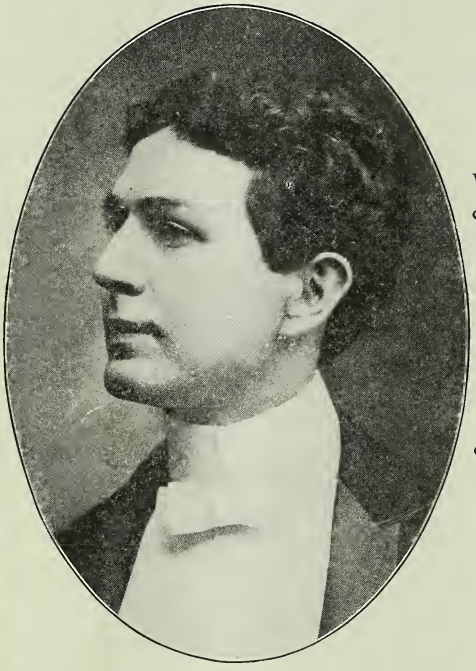

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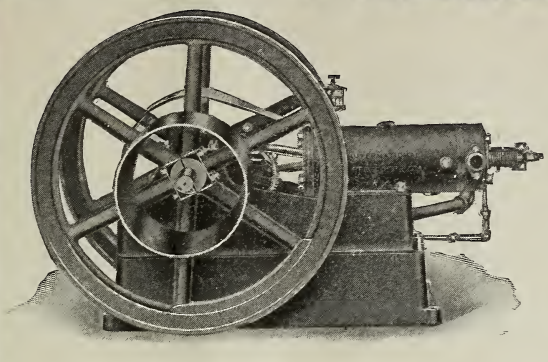

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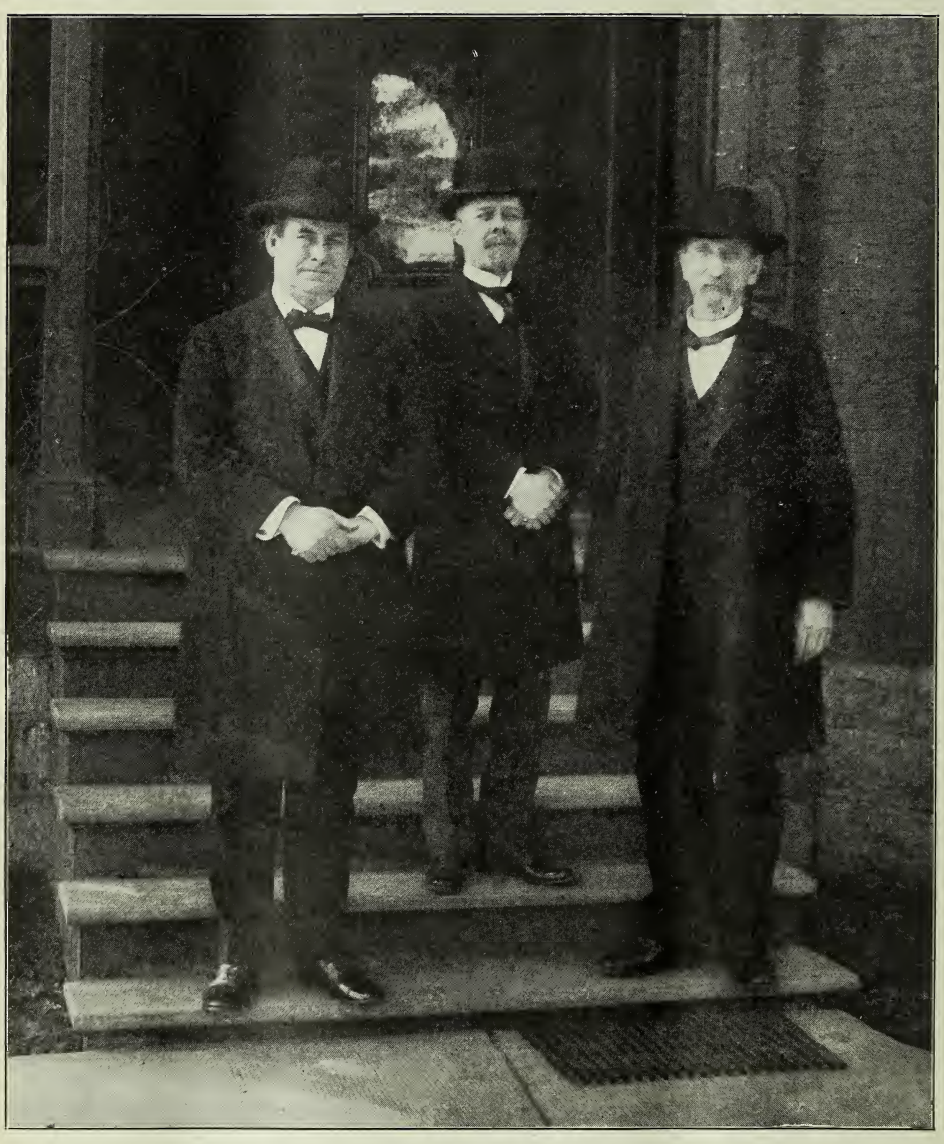

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ON THE VERANDA OF PRESIDENT THOMPSON'S DWELLING

THE AGRICULTURAL STUDENT.

VOL. XIII. OHIO STATE UNIVERSITY, COLUMBUS, MARCH, 1907 No. 6

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EDITORIAL NOTES

We are proud to note that Dr. Thompson, president of the University, is such a great factor in agriculture. He is not only in sympathy with the farmer, but actually goes out to his own farm during the summer, which is about twenty miles northwest of Columbus, and becomes a real live and up-to-date tiller of the soil.

President Thompson has not only identified himself with the many agricultural organizations of our land, both State and National, but has been present at the important sessions of many meetings to contribute his aid to the uplifting and betterment of the farmer.

He has also been influential in securing such men as Wm. Jennings Bryan, who inspires the students with his pleasant and convincing eloquence of speech, to awaken in them desires to take the broadest views of life.

In a late speech made by Mr. Bryan at the University, he plainly emphasized the importance of education, not only to the professional men, but to the farmer as well. He said that he once became very indignant at the remark made by an eminent preacher,

which was to the effect that the country is doing a wrong to encourage the education of the people who do manual labor. When we hear such men as Mr. Bryan and Dr. Thompson encouraging education of the farmer, should we let the advice of some illiterate person discourage us?

As Mr. Bryan has said, 'God made man with brains, and expects him to use them."

The Ohio Breeders' Association met at the University on February 19-20, and carried out a program that was a grand success. It was indeed instructive to feeders, breeders and students. Many expressed themselves as having listened to the best addresses they had ever heard along agricultural lines.

We regret, however, that there were not more farmers and breeders present at this meeting.

The membership of this organization has increased to four or five times the number there were one year ago.

The following officers were elected for the ensuing year:

George M. Wilber, president, Marysville, Ohio; H. M. Brown, vice president, Hillsborough, Ohio; C. S. Plumb, secretary treasurer,Columbus, Ohio.

Program of Ohio Live Stock Association

Tuesday, February 19, 9:30 A. M.

Report of the Secretary and Treasurer.

"The Live Stock Auction Sale,"

By Col. D. L. Perry, Columbus, O.

Col. Perry is one of the noted live stock autioneers of the country, with many years experience.

"The Feeding of Live Stock,"

By Dr. H. P. Miller, Sunbury, O.

Dr. Miller is a graduate of Ohio State University Veterinary College, a live stock specialist, and very prominent as a farmers' institute lecturer in Ohio and many other States.

Tuesday. 1:30 P. M.

Miscellaneous business.

"The Morgan Horse,"

By Dr. Carl W. Gay, Associate Professor of Animal Husbandry at the O. S. U.

"The Production of Hogs for the Market,"

By Mr. J. J. Ferguson, Chicago, Ill.

Mr. Ferguson was for some years instructor in Animal Husbandry at the Michigan Agricultural College, but is now with Swift & Co. of Chicago, in charge of their Animal Food Dept.

"Feeding Car Lots of Sheep for the International Live Stock Exposition,"

By R. J. Stone, Stonington, Ill.

Mr. Stone is one of the most prominent breeders and exhibitors of sheep in America, and is president of the American Oxford Down Sheep Association.

Live Stock Association Supper.

At 5:30 P. M., Tuesday, a special supper was served in the dining room of the Northern Hotel. Goodale st., near High, to which all members were cordially invited. The price was 50 cents each.

Tuesday, 8 P. M.

"The American Saddle Horse,"

By Major David Castleman, Clifton Farm, Pleasant Hill, Ky.

Major Castleman is noted as a breeder of American saddle horses and as an authority of high rank. The stables of the Castleman family have contained many famous American saddle horses. This address was under the joint auspices of the Ohio State University, the Columbus Riding Club and the Ohio Live Stock Association. Lecture in the University Chapel.

"The Shepherd and His Flock,"

By Mr. J. E. Wing, Mechanicsburg, O.

Among the notable men of Ohio, "Joe" Wing certainly holds high rank. He is known the length and breadth of America as an apostle of alfalfa and sheep. Through his writings and lectures he has come in close touch with a host of farmers. He is well known as a lecturer before the students of the agricultural colleges of Ohio, Iowa, Indiana, Nebraska, and elsewhere. For years he has been secretary of the Continental Dorset Sheep Club, and is actively interested in this breed of sheep.

—

Wednesday, February 20, 9 A. M.

"Treating Sheep for Internal Parasites"

By Dwight Lincoln, Milford Center, O.

Mr. Lincoln is secretary of the American Rambouillet Sheep Breeder's Association and an extensive breeder and importer of this family of Merinos. In the fall of 1906 Mr. Lincoln made an exportation to the Argentine Republic.

Adjournment from 10 to 11 A. M.

The regular University convocation occurs during this hour each week, and some of the members of the Association and others remained in chapel during the exercises. President W. O. Thompson of the University presided and the University and its guests were addressed by Mrs. L. A. Mead of Boston, Mass., prominently associated with the movement for Universal Peace. At 11 o'clock the Live Stock Association convened again.

Reports of committees; election of officers; miscellaneous business.

—

Wednesday, 1:30 P. M.

The Ohi Dairymen's Association and the Ohio State Live Stock Association in joint session.

"The Ohio Law Regulating Purity of Feeding Stuffs and What it Has Accomplished,"

By Hon. R. W. Dunlap, Ohio State Dairy and Food Commissioner.

A graduate of the College of Agriculture of the Ohio State University, Mr. Dunlap has been a leader in all that promotes the farmers' interest. As State Senator he introduced and secured the passage of the Ohio pure food law as applied to commercial feeding stuffs.

"The Anti-Toxine Treatment to Prevent Tuberculosis Among Cattle,"

By Dr. Leonard Pearson, Philadelphia, Pa.

Dr. Pearson is dean of the Pennsylvania University Veterinary College, and is also Pennsylvania State Veterinarian. Under his direction extensive and most important experiments have been and are now being conducted in relation to tuberculosis among cattle.

A joint debate on the subject:

Resolved, That the production and development of dairy cattle in Ohio offers a better opportunity for financial returns than the beef cattle industry.

Affirmative—L. H. Bailey, Tacoma, Belmont county; W. H. Rehl, Zanesville, Muskingum county.

Negative—Howard Gerlaugh, Osborne, Clark county; W. A. Martin, Kenton, Hardin county.

Judges decided in favor of the negative.

INDIANA TRACK MEET.

The results of the track meet on February 2 was Indiana 35, O. S. U. 42.

Henry Green, "Juice" Allen, and Glen Brock were participants from the Ag. College. Brock gets his 'Varsity "O" for breaking the indoor pole vault record held by any O. S. U. man.

Ohio Experiment Station Notes

S. B. S.

"Potato Investigations" is the title of Bulletin 174, recently published. It deals with variety tests, and spraying and seed selection experiments. About 150 varieties were tested and short descriptions are given concerning many of these, and in this way the grower can have a very definite idea about variety characteristics. The results of spraying are very interesting and mention was made of these in the February number. The possibilities and results of seed selection are given in some detail and the value of such work must be realized by every potato grower. We note the following in the summary:

"Careful and quite extensive experiments carried on at the station during the past three seasons have demonstrated that by selecting potatoes for planting from the most productive hills for a term of years the productiveness of a variety may be materially increased."

Bulletin 179, entitled "Fattening Range Lambs," is one of the most recent publications of the stations. It is a comparison of rations, the object of the experiment being to test the advisibility of fattening lambs with cottonseed meal, linseed oil meal or Dr. Hess' stock food with corn, alfalfa and clover. The method of handling, feeding and results are worked out in considerable detail; any Ohio sheep feeder should value this very highly because of the definite manner in which these are given. The cost of production and the gain in dollars and cents is given prominence and this we know is the most important consideration of all among livestock men. It is further conceded that the cost of concentrates is generally the determining factor of a feeding operation and in this bulletin splendid chance is given to study this with the feeds named.

We have also received an item concerning a pig feeding test which was conducted by Mr. B. C. Carmicheal during the past summer. It certainly tells a good story to those who are interested in dairying. We thank Mr. Carmichael for this communication, and are glad to note that the students of tne college are interested in this line of work at the station.

"In a pig feeding test which began July 6 ten pigs were fed in two lots of five each at the Ohio Agricultural Experiment Station as follows:

Lot 1, corn and bluegrass pasture.

Lot 2, corn, skim milk and bluegrass pasture.

Each lot was fed all of the corn that they would readily consume, and each lot had access to the same amount of pasture.

At the beginning of the test the pigs in lot 1 averaged 69.8 pounds, while those in lot 2 averaged 76.7 pounds. On September 21, the pigs in lot 2 averaged 205.5 pounds, while those in lot 1 averaged only 155.9 pounds, or, in other words, lot 2 had gained 643.8 pounds while lot 1 had gained only 430.6 pounds.

During the period from July 6 to September 21, lot 1 required 385 pounds of corn for each 100 pounds gain; lot 2 required 261 pounds corn and 865 pounds skim milk. The average daily gain for lot 2 was almost exactly 50 per cent more than for lot 1.

At this stage the pigs from lot 2 were sold, pigs of this weight being worth $6.90 per hundred weight in Pittsburg, September 21.

Lot 1 was fed until their gain was 640 pounds, almost exactly that of lot 2. They had reached this point on November 2 and were sold, being worth in Pittsburg, $6.40 per hundredweight. During the period from July 6 to November 2, lot 1 required 427 pounds of corn to produce 100 pounds gain.

Beside the difference in grain consumption, lot 1 required much more grass than did lot 2, as shown by the shorter grass in their pasture at the end of the test."

A Comparison of the Ohio and California Quail

There are many people whose experience is so limited and their horizon so narrow that they sneer at game protection and see in it nothing that is practical. But, everyone acknowledging that the well-being of the country depends on the well-being of its farmers should realize that if the work done by the Bureau of Biological Survey should be abolished, a blow would be dealt to our agricultural interests from which they might not recover for many years, since among other things this Bureau occupies itself with game protection. It inquires into the food habits of mammals and birds, has learned much about what species are injurious to agriculture and what ones are beneficial. It has learned and is explaining to the people that the birds which destroy noxious animals, insects, and seeds should be proctected and encouraged, so that the farmer may have the assistance of these helpful species.

We will all agree, I believe, that the quail is one of the most important as well as one of the most interesting of the birds that come under the jurisdiction of game protection. He is very widely distributed in America, being found in nearly every state of the union, and in Canada, and may be truly called the prince of American partridges. Although there would be no trouble in recognizing him as being the quail wherever met with, yet on becoming better acquainted with him one would find his habits and customs varying slightly in different localities, this variation being probably due to differences in environment.

To illustrate these differences our Ohio quail commonly called Bob White and the Valley quail of California will serve as good examples.

When the warm sunshine of early spring awakens life to renewed activities, then it is that the quail turns his thoughts to love. He first chooses the spot where he intends building his nest and then he chooses his mate. He stands erect, proud and defiant, calling from some old stump or dead bush, in a loud, clear voice, and the country folks all know that the quail is nesting.

The nest is usually built in a slight depression in the ground, and is chiefly composed of dry leaves and a few spears of grass. In these nests are deposited from fourteen to as high as twenty-two sharp pointed oval eggs of a dirty white color, covered with dark brown spots in the case of the Valley quail. In the case of the Bob White the eggs are dirty white without the spots and are always arranged with small ends toward the middle of the nest, and if numerous there are two and sometimes three tiers piled up like cannon balls, and as high as twenty-six eggs have been found in one nest. The male assists in the incubation of the eggs as well as in the care of the young, and a proud father is he.

In about twenty-three days the eggs hatch, and the young have often been

seen running from the nest with a part of the egg shell attached to them. The eggs all hatch about the same time, and the whole family do not go any great distance from the nest, but nevertheless never remain very near it. Persons watching a nest have often gone to it and found the eggs all right, none being even pecked, and returned in a few hours to find all the eggs hatched and the family moved. For a time after hatching they are very quiet and no matter how careful one may watch he will see and hear but little of them. In the meantime the young are taught to shun danger in various ways, first being by "freezing"—trusting to their protecting colors for safety. The assembly is a means of mutual protection and the call for assembly is given by the old birds. The family remains together during the whole winter and the young are constantly being taught by example how to avoid danger. The signal for danger is a low chuckling rattle, which might be mistaken for field mice. They soon learn that their lives depend on their sharp eyes and swift movements.

As a game bird the California valley quail is the most gamy and resourceful of the two. In fact, there is no bird which can more sharply test the nerve, eye and skill of the hunter or prove the good qualities of a dog than can this one. On the flocks being flushed and followed they scatter and lie well and close and afford great sport in shooting over a well trained dog.

They will lie until almost stepped upon, and when they do flush will rise with a great whirr of wings that will startle almost anyone and are off like "a streak," presenting a mark that will test the ability of the best of marksmen. He who thinks he is a good hunter of jacksnipe or Bob White, will find something wrong when he first tries to shoot the Valley quail, and is likely to burn some powder before he succeeds in dropping one. On being much hunted they become very wild and resort to places hard to get at and shoot over. Unlike the Bob White, they roost in trees and are consequently better protected from their natural enemies. Often when flushed they will alight in live oak trees, from whose thick branches it is hard to flush them.

In California the young birds remain together in flocks in the valleys and do not migrate, remaining all summer near where they are hatched. Late in the fall, however, when the days get short and colder, they will go to the tops of the hills where they will be able to get the early morning and late evening sun. Here three or four families will come together and will in turn consolidate, there sometimes being as many as 300 to 1,000 birds in such a flock. These large flocks remain together all winter, and do not disband till the next mating season, when those that have mated will leave the big bevies and go to the valleys to spend the summer and rear their young.

The unmated birds remain on the hill tops and in rough places. These unmated birds are always very wild and flush far in advance of the hunter. The mated birds on the other hand become very tame when unmolested. They often build their nests in old straw sheds or hay barns, where they become almost as gentle as the domestic fowl. On the lawns surrounding the country residence of the late Alonzo Hayward, near San Mateo, Cal., there can be seen almost any afternoon about 1,000 wild valley quail as they come out of the shrubbery around the buildings to be fed by the gardener. In Golden Gate

Park, and in all the cemeteries in the city of San Francisco, can be seen thousands of wild valley quail.

On the other hand, here in Ohio it is fairly evident that the flocks found in winter time are of single families only. At night and during severe storms the birds find some sheltered spot as free from danger as possible, and pack themselves into a close circle, tails touching in the center, heads outward to detect danger in any direction, each warming the other.

Mr. Robert J. Sims of Jefferson, O., once fed a flock during a winter. They came regularly for the supper provided and passed the night under an evergreen tree in the yard. Mr. Sims describes the method of their arrangement as follows: "First, two birds stood together, tails touching, then a third and fourth crowded up, then others crowded their way into the charmed circle, pushing and elbowing the birds closer together, until finally only one remained outside. He hurried around the circle, trying first one place and then another to get in, but to no purpose. There was no more room. Not to be left out, he sprang upon the backs of the close packed flock, examined each seam, and finally began to wedge himself down between two until he, too, became a part of the circle. The birds now settled themselves for the night, their breast feathers almost blending into a perfect curve all around the circle. In the morning they were ready for their breakfast of oats and corn, and then went forging in the fields for grain, weed and grass seeds."

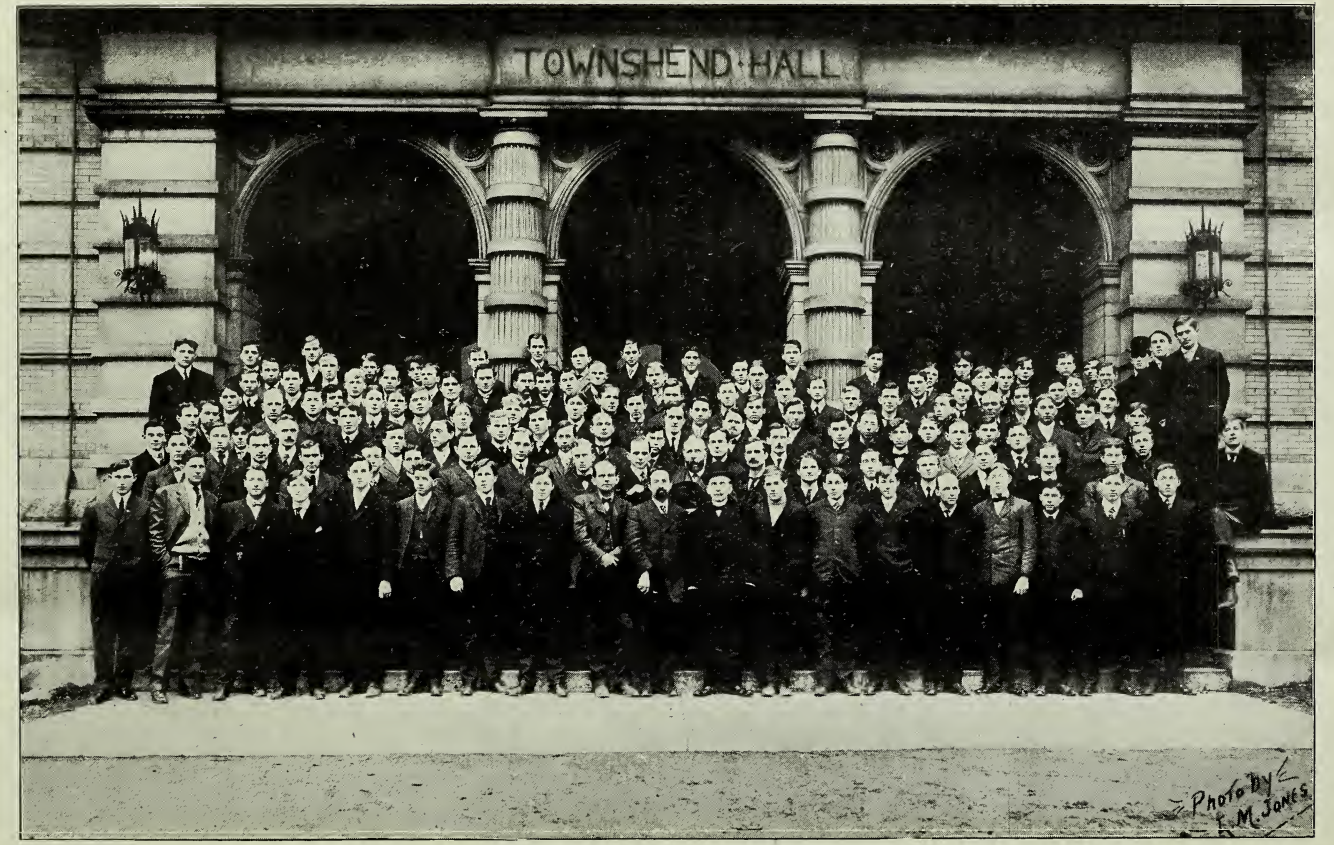
The quail is a model parent, willing to sacrifice his own life for his brood, being as good a parent in California as in Ohio. Methods by which the old bird will resort to to protect the young are illustrative of the mental development of the quail. The old broken-wing trick, the pitiful cry, the plain invitation to kill the old bird and be satisfied, and very rarely the daring attack upon the intruder, while the young seek shelter are examples of his mode of protection. So taking all in all, as has been said, "There is much to admire in the quail, and little to excuse, wherever he may be found."

H. E. ALLEN.

Some Lessons From the West

When one hears of the wonderful yields obtained from irrigated lands in our Western country—yields in many instances more than twice as great as we obtain here in this region of abundant rainfall, he is made to realize the immense importance to crops, of an abundant supply of moisture at the proper time. The latter feature is of even greater importance than the question of quantity. Here in Ohio we have on the average a greater supply of water annually than is supplied to irrigated lands, but the distribution is so uneven that crops sometimes suffer severely during the growing season for lack of moisture.

A short time ago Professor Ball, dean of the Agricultural College of Utah, gave an exceedingly interesting talk on Western agriculture, before the Agricultural Society of Ohio State University. Professor Ball comes from a region where irrigation is extensively practiced and where practically all farming is irrigation farming, as the rainfall amounts to but a very few inches per year. His talk was a recital of the methods of farming under such conditions, the crops raised, prices realized, experiments along irrigation lines and holding the moisture in the soil, social features, and in fact a little of



STUDENTS OF THE TEN WEEKS WINTER COURSE AND FACULTY, OHIO AGRICULTURAL COLLEGE

everything that was interesting to one unacquainted with conditions in that region. Anyone listening to this talk could not help being struck with the fact that these farmers, in solving their problems, have discovered many things which will prove of great value to farmers everywhere.

The writer wishes to discuss some of the features of farming in the arid regions, and point out what seems to him some valuable points for farmers where the rainfall is abundant, but poorly distributed throughout the year, as is the case here in Ohio.

To the average person it is difficult to realize the great value placed upon water in the arid countries. As Professor Ball said: "With us land itself is worth nothing—absolutely nothing. We have an abundance of it; deep, rich land, with an immense amount of fertility stored up ready for plants to use, but worth nothing without water. The only land possessing value is that which is supplied with a source of water for irrigating, and there it is indeed valuable land. The water alone makes it valuable. So people don't buy land; they buy water and the land is thrown in." Where water is so valuable its most economical use is imperative. None must be wasted or the profits will correspondingly decrease.

In this country of bright—almost perpetual—sunshine and hot, dry air, water, when exposed to the atmosphere, disappears as if by magic. Water applied to the land must be protected or it will quickly be drawn out by the hot sun and dry air. So when water is applied these people quickly cultivate the soil and form a mulch to keep it from escaping. This is practically the only way of keeping it for the plants. The problem is not only to get the water on, but to hold it there, and the latter part is not the least important. Heavy applications of water at long intervals, followed by cultivation as soon as possible, rather than frequent light applications is the secret of success. They must know when to apply the water and how to keep it after applying, so that it will not evaporate, except through the plants themselves.

They do wonderful things out there in this matter of hoarding up water in the soil. An instance of this is the so-called "dry farming," which is practiced where irrigation is impossible, and where there is a slight rainfall during the year. Under this system they do not try to raise a crop every year, or a large crop at that, but a small crop every two years. However, it pays, because there is no cost for water and the crop is produced cheaply. It has been discovered that, if conditions are made right a great part of what rain does fall can be stored up in the soil until enough has been accumulated to mature a crop. For this kind of farming a piece of land is chosen which has a deep soil and of uniform depth. The cacti and brush are cleared off and the ground plowed very deeply and worked down to a good seed bed. This is done during the summer or fall and as most of the rain falls during the winter it is in good condition to catch and absorb what does fall. In the spring this ground is thoroughly worked and a deep dust mulch formed to prevent the evaporation of the moisture, and at intervals throughout the summer again harrowed over to keep the mulch in good shape. Especially if a shower comes which does once in a great while, it is necessary to reharrow. In this way about 80 percent of the moisture of the previous winter is kept in the soil. In the fall the ground is seeded lightly and with the aid of

what rain falls during the winter a respectable crop is raised. Everything is done on strictly scientific principles —no half a yard work about it. The amount of seed sown is regulated by the amount of water stored up. Usually one-half bushel of wheat is the seeding. If too much is sown the crop will not mature, but grow until time for grain to form and then the water being exhausted by the large growth of straw, will wither away in a single day.

This discovery of how to grow a crop without irrigating, where before only cacti and sage brush grew, has meant much to the Western farmer. He cannot afford to raise wheat on his high-priced irrigated lands, because the yield will not be sufficient to pay him. He must grow crops that pay a large return per acre. On the other hand, the people must have wheat for their bread and to ship it in means to pay high freight. So it is easily seen the great advantages occurring from this source. To use an expression dear to one of our professors, such farming as this is "Resolutely facing nature as she really is," and making the most of it.

Another thing the farmers in the arid regions are carefully studying, is what crops will return the maximum profit on the high-priced irrigated lands. They have found that it will not pay them to grow wheat, oats, corn and other cereals, for while the yeild is large per acre the returns in money are not equal to that from other crops. So they have experimented first with one thing and then another until they have found crops especially adapted to their conditions which will realize a handsome profit. Sugar beets, choice fruits and alfalfa hay are some of them.

After learning about some of the methods in use in the West and their successful results, it seems almost absurd for an Ohio farmer to ever complain about a lack of water at any season of the year. We have a great plenty of it, if rightly managed, and kept in the soli where the plants can get it at any time. If those men in the West can hold 85 per cent of a small rainfall in their soil all through a long hot summer, ought we not to hold at least 50 per cent of our winter rains for the cultivated crops of the ensuing year? The answer is, yes. It can be done if conditions are made right, and it is the farmers' business to make them right. The principles of holding the moisture is the same here as in the West, only it is much more easily done and the supply infinitely greater. Plenty of humus in the soil to absorb the water, fall plowing to get the land in condition to catch the maximum amount, and then early and frequent cultivation to prevent its loss by evaporation; these are the secrets of having plenty of moisture even in a dry season. When farmers learn how to husband the water supply, they will come to desire a fairly dry season in preference to a very wet one, with its accompanying losses during harvesting of crops, time, etc.; also the loss of fertility by leaching, which is one result of heavy summer rains.

Experiments to ascertain what crops pay best on certain soils will also prove a paying proposition. Many farmers grow certain crops as a matter of fact with little thought of whether something else would not pay better. If land will not raise a large crop of oats it will not pay to raise oats, or if poor wheat land it will not pay to raise wheat. A good example of this kind of farming is furnished by the South, where cotton is grown. The people think they must raise cotton, although

there are perhaps crops that will pay them much better.

Taken as a whole the agriculture practiced in the arid West is of a high order of excellence, as it must be to succeed. Those farmers are now setting the standard for the country for scientific methods and real brainy farming. E. KINNEY.

Liming

The origin of the practice of liming is by no means recent. It is said that the old Romans as well as Japanese and Chinese, were, in ancient times, well acquainted with the process.

Lime is an essential constituent of plants, although needed only in small quantity. In most soils lime is present in sufficient quantity to satisfy this requirement. It is evident that soils derived from limestones and rocks rich in hornblende and other lime minerals would naturally contain sufficient lime, but soils derived from certain granites, micas and many gneisses and schists, might be very deficient in this constituent.

The calcium requirement of plants differs considerably, as does also the condition of the soil, physically and chemically, as modified by lime content. From data at hand it seems to be the opinion that such crops as rye, corn, melons, and certain grasses are not appreciably benefited by artificial applications of lime. On the other hand, such crops as clover, barley, timothy, lettuce, beets, etc., are materially benefitted under certain conditions. In other words, the latter crops are injured by soil acidity. In general, correction of acidity is the main reason for artificial application of lime. However, lime has other beneficial effects, when applied to certain soils. Acidity, it is thought, is due to certain humic acids, formed in vegetable decay, especially in muck or low swamp lands, to sulphate of ammonia, which on nitrification is thought to yield some free sulphuric acid, which reduces the basic constituents, and finally to certain sulphates of iron. This acidity, when once produced, tends to check further decomposition and nitrification, a condition which lime will often remove. Physically, clay soils are especially benefited by lime, being made more open. while sandy soils are made more compact. A third beneficial effect of lime is designated by Professor Loew, chemist of the Bureau of Plant Industry, as its physiological effect, in promoting bacterial growth, and as an essential constituent of vegetable tissues.

Besides the benefits mentioned, others not so conclusive, are believed to be traceable to lime. It was thought that lime helps to liberate potash from its mineral compounds. The New York Experiment Station investigated this, and found that calcium sulphate seemed to be more energetic in this respect than either the carbonate or oxide.

Many experiments have been carried out by different stations, principally along the line of soil acidity. The Rhode Island Station has found that acidity in soils is not confined to muck or lowlands, but affects upland soils as well. They found that upon acid upland soils in Rhode Island such crops as beets, lettuce, clover and timothy could not be grown until lime or other basic material was applied. This station found that the carbonate of lime regulated acidity better than other compounds, and obtained with beets, a percentage gain of 10,000, by using this substance on acid soil. They conclude that in Rhode Island ,at least, the chief benefit from application of

lime is in its neutralization of acidity.

Acidity is a condition existing over a large portion of northeastern Ohio. This condition was present for some years on the Ohio Experiment Station farm. It was found that for some years clover would not do well. Fair stands could be secured, but were usually killed out during the winter. Lime on such soils doubled the clover crop. It was found that soils whose acidity had been aggravated by potassium chloride, ammonium sulphate and acid phosphate, readily responded to lime, and gave good results.

Acidity on these soils was usually shown by growths of sorrel and other plants which thrive in acid soils. It was also found that soils which were low in humus were much benefited by lime. However, in such soils, lime, by increasing decomposition of organic matter, and nitrification, reduces the humus content, so that it is essential in applying lime, to also keep up the humus content with manures.

The Ohio station also found that the wheat crop was reduced by direct liming, and that better clover crops were obtained when the lime was applied to corn two years before the clover was sown, which was then followed by oats and wheat.

To sum up, excessive applications of lime are injurious, destroying beneficial bacteria, greatly reducing the humus, and the yield of certain crops, so that it is necessary in using lime to guard against excess. Apply it to the proper crops and also to keep up the supply of organic matter in the soil.

R. C. COLLISON.

The Sugar Beet

The sugar beet does not require a particular kind of soil for its proper production. In general, it may be said that any soil which will produce a good crop of Indian corn will, under proper cultivation, produce a good crop of sugar beets. In ordinary soil the space between the rows should be about 18 inches. In very fertile soil the rows should be placed closer together, and in a less fertile soil farther apart. The distance between the beets in the row also depends upon the nature of the soil. In general, there should be one plant for each six or eight inches.

The seed should be planted from the first to the tenth of May. Drills are used for planting the seed, which are built to operate on the principles of ordinary grain drills. The amount of seed usually required is fifteen to twenty pounds per acre. About the time the beets show the fourth leaf the process known as "blocking and thinning" is begun. "Blocking" is accomplished by walking along the row with a short handled hoe, sharp and of sufficient width, cutting out part of the plants so as to leave bunches the proper distance apart for the plants in the row. Thinning is accomplished by creeping along on the hands and knees and removing all the plants in the bunch except the one selected as the strongest plant.

Beets should be cultivated very thoroughly from the moment they come in sight until they become so large that it is impossible to continue. The object sought in cultivation is the elimination of the grass and weeds, the conservation of moisture, and the loosening of the soil around the plants. Clean cultivation is necessary in order that the beets be pure, and high in sugar. If sugar beets are grown and properly cared for the ground is practically free from weeds and grass, and thus if they are used in a crop rotation this will aid in the destruction of these weeds.

As soon as the crop has matured the next work is to harvest it. The beet grower can readily discern when the beets are ripe. The leaves take on a yellow color and drop off. Then the sooner they are harvested the better, as they have reached their maximum of sugar content and purity. Warm fall rains are liable to start a new growth of the beets, causing them to send forth a fresh supply of rootlets. This will decrease the purity and sugar content of the beets. It is apparent that the crop should be delivered at the factory as soon as possible or siloed. Siloeing is performed by placing the beets in piles after they are harvested and covering them with dirt to prevent evaporation and freezing.

There are many kinds of harvesters in use. One very common kind is an implement in the shape of a plow. Instead of a moldboard it has two shanks each terminating with a prong—like a finger. These are forced through the soil one on each side of the beet at a depth of nine or ten inches. The openings between the two fingers gradually lessens as the beets pass through the space between them until finally the tap roots are broken and the beets are lifted two or three inches from their position in the soil, whence a person following the plow can easily pull them out.

Topping is the next thing to be done, and consists in removing the crown and leaves of the beet by a single stroke of a knife. After the beets are topped they are thrown into piles. They are now ready to be delivered. Anywhere within a distance of ten miles from the factory they may be delivered in wagons. At greater distances the usual delivery is by railroads. Where the beets are grown at a distance from the factory special dumps are usually built near a side track of a railroad, where it is convenient for the surrounding farming district. Such a dump is elevated and approached by a long incline, at the lower end of which the beets are weighed and then driven onto the dumping platform. By means of the dump the whole load is then precipitated into the car below.

The work in the beet fields is usually done by foreigners. All of these laborers generally live in tents or other temporary abodes. They take contracts in the beet fields for so much per acre, usually receiving from $15 to $20 per acre for all the weeding, blocking, thinning, hoeing, topping and loading. The farmer does all the necessary cultivation requiring horses, and the work of plowing up the beets and delivering them to the factory. The following is the average cost of producing a crop of beets in the northern part of Ohio. Blocking and thinning, $6; hoeing, $4; pulling and topping, $8; making a total of $18 per acre.

W. L. Lathrop.

Certified Milk

For the past few years the great mass of medical men, hygienists and the general public have been demanding a better milk supply, especially for infants and invalids who are in the main dependant upon milk for their life.

To meet this demand many firms have been producing milk under the rules and active supervision of medical commissioners in the cities where the milk is sold. These physicians have the public health at heart and work in its interest at no cost to the people; their rules governing the production of this milk are very rigid and the strict observance of these regulations entitles the dairyman to a certificate each month, stating that his place and prod-

ucts have been examined and found to be up to the standard.

A copy of this certificate usually goes with each bottle of milk sold. To discuss the producers side of the question here seems folly, for the leading papers are full of the subject, but it may interest some to hear of the prices that "certified milk" receives. The prices vary, according to the city, demand and established trade reputation.

In New York the average price is 18 or 20 cents per quart, 10 or 12 cents per pint.. This milk usually tests between 4 per cent and 5 per cent butter fat.

Cream sells at prices in proportion with the milk price. Taking 4 per cent milk at 18 cents as the basis of our figures, 16 per cent cream would sell at 72 cents of 75 cents per quart.

In Philadelphia certified milk sells for 14 and 16 cents per quart and is put up at a definite per cent of fat, 4 per cent and 5 per cent. Skim milk in this town is called "fat free milk," and sells at 8 cents per quart.

Cream here sells in the same ratio to milk as New York or a little higher:

16 per cent cream is.... 80 c. per qt.
25 per cent cream is....$1.00 per qt.
40 per cent cream is....$1.20 per qt.

And is sold in half pint bottles only.

Some dealers put up milk according to a prescription from a physician in 2, 3, 4, 6 or 8 oz. to a feeding in separate bottles as directed.

The prescription might call for six feedings of 4 oz. each, or 24 oz. of milk.

The cost of this prescription put up in this way would be about 40 cents and the same prescription put up in a quart bottle of 32 oz. would be 25 cents.

Then another part of this business is the shipment of milk on ocean steamers for customers bound for a trip down the Nile, Europe, Asia, Africa or even the Phillipines.

Customers who can afford this class of milk usually spare no expense in order to have their milk placed on board the steamer just before the vessel sails. Aside from paying 50 cents per quart, 25 cents per pint, 15 cents per half pint for milk and double the usual price for cream, 5 cents for each bottle shipped and $3.50 for each steamer case, all express charges and icing, some customers rather than trust the express companies to deliver the goods engage special messengers to go with the shipment from the farm and see that it is placed in the ship's cold storage rooms.

The writer has attended to many shipments of this kind and can assure anyone that it is costly. The price of shipping milk as above outlined would cost at least $1 per quart, and the bill must be paid before a quart is bottled.

All this tale of high prices may give one the idea that to produce and sell certified milk one would get rich quick. But this business is like any other, it needs careful management.

I will not go into any discussion here as to what is needed to produce or sell certified milk, but will only say that with the right conditions it can be produced and sold at a profit.

Wm. G. Van Meter.

DISPLAY AT THE HORTICULTURAL EXHIBIT MEETING HELD IN JANUARY

Alkali Soils, Their Character and Reclamation Occurrence and Formation

Alkali soils are soils in which the percentage of soluble salts is so high as to render them unproductive agriculturally. Such soils are found in North America west of the 100 meridian up to the Cascade mountains and northward beyond the line of the United States and southward into Mexico. In South America in portions of Peru, Chili, Brazil and Argentina, in Europe along the border of the Mediterranean, in Africa on the Saharan and Libyan deserts, parts of Egypt and part of South Africa, in Asia, parts of Asia Minor, Syria, Mesopotamia, Persia, Northwest India, West China, as well as in parts of Australia. The causes of the formation of these salts are simply those constantly at work in soil formation. The decomposition of the feldspars as granite, deasite, trachyte, hornblend, etc., results not only in the production of clay, but in the formation at the same time of solutions of carbonates and silicates of potash and soda. These solutions coming in contact with compounds of lime and magnesia are partially taken up, forming complex insoluble hydrous silicates. In this reaction potash whenever present enters into combination more readily than soda, thus when a solution of a potash compound is brought into the presence of a hydrous silicate containing much soda, the latter is replaced by the potash and being insoluble tends to be washed away. If, however, the rainfall is not sufficient for proper moisture (less than 20 inches per year) as is the case in the areas mentioned above, these compounds of soda remain and form the alkali soils. What rain falls dissolves these salts and then through evaporation deposits them at the surface in the form of a saline crust. If the soil or substrata is impervious, or if the surface is sloping, the accumulation will be somewhat checked. Alkali soils formed in this manner were the ones common to the early settlers in the west, but since the settlement of

parts of our western country and the reclamation of the arid region by irrigation portions of the lowest lying land which formerly was very fertile has become of late so salty as to render it unproductive. The cause for this has been over-irrigation, or loss of water from irrigation canals, or both. The excess of water applied to the higher portions of the land has seaped through the soil, dissolving out the soluble salts. This water flowing toward the lower lands rises the water level, bringing it near enough the surface for the water to be by capillary attraction and upon evaporation to deposit the salts. In this manner numerous formally productive fields are being ruined.

Kinds of Alkali.—There are two distinct types of alkali generally recognized, the black and the white. Black alkakli is carbonate of soda (salsoda) and is given its black color by the dissolution of the soil humus, which it causes. It is the most destructive to plants. White alkali is composed of a number of salts the most common being calcium chloride (common salt), sodium sulphate (Glouber salts) and magnesium sulphate (Epsom salts): With the above are usually found 5 to 20 per cent. (of the total salts) sulphate of potassium, a trace to 4 per cent. of phosphate of soda, and a trace to 20 per cent of nitrate of soda. These are the elements which we aim to supply to our plants in fertilizers and the washing out of the above elements is the chief objection to continually washing the soil to correct alkalinity. Black alkali is usually low in nitrogen and high in phosphorus, while white alkali is low in phosphorous and high in nitrogen.

Effect Upon Plants.—The effect of alkali upon the plant has been a subject of great scientific interest. The effect on trees seems to be from four causes, first, the radiating power of alkali soils which often burns the edges of the leaves; second, the salts accumulate in various parts of the plant and practically choke it; third, injury to the root basis, this is usually the case in lands very heavily charged with common salt. The gradual rise of water from below has seriously injured and even destroyed old orange orchards. Fourth, burning by the accumulation of excessive alkali on the ground. The rough bark of the tree is found to be almost black and the green layer underneath has turned brown to a greater or less extent, the plant has been practically girdled. In green herbaceous stems the damage is down at the root crown, the bark is turned to a brownish tinge, is soft and easily peeled off. It has been found that small amounts of soluble salts in the soil not sufficient to injure the plants have a retarding effect on the germination of the seed due, it is thought, to its hindering the seed from absorbing sufficient amount of water, due purely to osmatic pressure.

Sodium carbonate is the only salt that seems to exert any poisonous influence as it was found by experiment at the Wyoming Experiment Station that seeds readily germinated when removed from the alkali solution and put under favorable conditions. The amount of alkailimity that plants will withstand depends upon the kind of plant, the texture of the soil and the distribution of the alkali in the soil. At Tulare Station in California the amount of alkali that the cereals would stand on a sandy soil was found to be about .1 per cent. of sodium carbonate, .25 per cent. of sodium chloride, and .45 to .50 per cent. of sodium sulphate, and clay soil much less. Of the common fruits the grape and the olive seem to be the most resistant, while the

orange is fairly resistant, of the common cultivated crops sugar beet and sorghum are the most resistant. The common vegetation or alkali spots and plants that only grow on saline soils are Tussoch grass, Greaseweed, Dwarf Samphire, Bushy Samphire, Saltwart, Alkali—Creath and Cresso.

Reclamation.—The great fertility of the alkali soils when once freed from their soluble salts has made their reclamation very important. The western states and the United States government, as well as some of the foreign countries, have spent large sums of money devising and studying out means whereby these soils now practically worthless could be made into productive fields. Various means have been devised both for the purpose of reclaiming those soils already alkaline and for preventing others from becoming so.

Counteracting Evaporation.—A preventative rather than a reclamatory method quite often practised has been counteracting evaporation. The evaporation of the solution containing the salts and the deposition and concentration of the salts upon the surface is in most cases responsible for the formation of alkali soils, if therefore the evaporation of the soil water can be checked the accumulation of these injurious salts will be materially lessened. The common means employed to check evaporation have been shading the ground, mulching or by loose tilth. It has been found that in cases where alfalfa could be started by washing out the salts in the upper layers of soil it would continue to grow when once becoming thick enough to shade the ground, even though there was enough salt in the soil to kill the plant if evaporation had not been checked and the salt had accumulated at the surface. Mulching has been employed in orchards with good results, evaporation having been checked in this manner and orchards saved that otherwise would have been ruined. Loose tilth or the creation of a soil mulch accomplishes the same purpose and in many casese is cheaper and just as satisfactory as other mulches. It has the advantage of furnishing tillage to the orchard and at the end there is not a large amount of accumulated material to be disposed of.

Diluting the Alkali Salts.—Another method that is satisfactory and inexpensive when the salts are not excessive is a deduction of the alkali salts by diffusing them through the soil by deep cultivation. In alkali spots in the natural state the most of the salt will be found in the upper six inches. To this depth the soil may contain so much salt as to render it non-productive. If, however, the salt accumlated in the upper six inches is diffused through twelve inches of soil the salt will be diluted to such an extent that satisfactory crops can be grown. This deep cultivation at the same time encourages the plants to root deep which is very essential in arid countries.

Growing Resistant Crops.—It has been found that certain plants are much more resistant to alkali than others. This fact has been taken account of in alkali reclamation work and much land which formerly gave none or unsatisfactory crops have been made productive. Of the crops used for this purpose sugar beets are perhaps the most important. Beets may be grown on a soil containing as high as 12,000 lbs. of alkali salts per acre in the upper three feet, provided that sodium chloride does not exceed 1,500 (.04 per cent.) The maximum tolerence for sodium carbonate (black alkali) being 3,000 lbs.,

or .076 per cent. in the first foot. For sodium sulphate 7,2000 lbs. or .179 per cent. From analysis of beets produced on alkali soils it was determined that the alkali was not detrimental to the sugar content, it slightly increases the weight of the leaves and percentage of ash, but had no marked influence on the maturing of the crop or amount of dry matter. Sorghum and barley are both resistant and are used as reclamation crops as well as pomgrannets, mulberries, grapes, orange and olive.

Chemical Remedies.—The treatments discussed so far have applied only to those soils slightly alkaline or soils in which there was danger of their becoming alkaline. For soils in which the salt content is high other methods than these must be resorted to. The cause of alkalinity being chemical, naturally the first attempt toward its correction would be by chemical agents. It was found that soils afflicted with the carbonate of soda (black alkali) to such an extent that they never had produced anything of value, have upon the simple application of gypsum, together with water and tillage to break up the alkali crust, yielded abundant crops. When the carbonate was very abundant this gypsum mitigated though not altogether relieved the trouble and in this case it must be supplemented by other means such as flooding and drainage. The action of gypsum upon the carbonate of soda is that it changes the carbonate into the sulphate or the black alkali into the white alkali, which is far less harmful than the former, and in many cases this has proven to be all that was necessary to do away with all trouble with alkali, although it will be readily seen that if after this conversion the white alkali is sufficient to be dangerous other methods for its removal are necessary. Besides the above change gypsum has the power to fix the alkalin phosphates in the soil and to change the humus from the soluble to the insoluble form thus preventing their being washed out more or less with every rain or irrigation. In some cases as high as seven tons of gypsum have been applied to the acre with profit. To neutralize each thousand pounds of sodium carbonate it takes 1630 pounds of pure gypsum or about a ton of the gypsum as bought on the market. The apparent effects of the application of gypsum are that the black puddles and spots disappear, the free dissolved humus being restored to the land; the soil becomes loose, crumbles and bulges into a broken mass; seeds now germinate on the surface and plants spring up; the soluble phosphates present are decomposed.

Removing the Salts From the Soil.—In many cases especially when the amount of salts are high or when the trouble is entirely due to white alkali, there is only one method of procedure by which reclamation may be accomplished, namely by removing the alkali salts from the soil. This is both a laborious and an expensive operation, but the great fertility of these lands has in many cases justified the expenditure. The first means employed was by scraping off a few inches of the surface soil, as most of the salts are found near the surface this accomplished the desired result, but the great expenditure of labor was found to be impracticable. The method that is most generally employed and the one that has given the greatest satisfaction is the removal of the salts by drenching with water. In very pervious soils and in white alkali the washing out can be accomplished without any special provision for underdraining by leaving the water on the land sufficiently long, but

underdrains accelerate the work and make success more certain. With black alkali gypsum should first be used to break up the impenetrable hard pan and to prevent breaking of humus and soluble phosphates. In carrying out this method of flooding the land is usually leveled off so as to be able to get a uniform stand of water over the entire surface. If the land is to be drained by open ditches it is them divided into small tracts of a few acres by drainage ditches two and one-half to three feet deep and 150 to 300 feet apart, depending upon the lightness of the soil and the washing is carried on for from one to three years, depending upon the ease with which the salt is washed away. If the land is to be drained by tile ditches, which is the most practical in this country, there is usually one main ditch running through the center of the acre with laterals branching off from this at distances varying with the texture of the soil; these ditches are usually three feet or more deep. In the reclamation of the Houdo bottom, near Roswell, New Mexico, it was found that drains less than three feet deep were not effective and that ten floodings removed one-seventh of the total alkali from the first two feet and carried a large amount of that in the first foot down into the second. It was also found advisable to cut off the seepage water from irrigating canals or higher land by putting in drains on the side of the land from which it comes. The cost of open and tile drains combined varies from $20 to $30 per acre. In work of this kind the manner of laying the ditches and constructing the canals will necessarily have to be varied to meet new conditions.

In the reclamation work it is usually the case that no one system will be used to the exclusion of all others, but that they will be combined. Gypsum on black alkali will be used in connection with flooding and alkali resistant crops will be grown as far as possible during the time that the work is being carried on. Cultivation of the land to prevent evaporation, cropping with plants to shade the ground, the conservative use of irrigation water and tile drains will all be employed whenever found practicable. While drainage is perhaps the only effective method of removing alkali it is at the same time the most expensive and all other means possible should be employed to present the accumulation of the salt, thus making its removal unnecessary in places not materially infected. L. E. Call.

Alumni Notes

B. L. West, '06, is cataloging for an extensive mail-order house in Columbus, Ohio.

Fred Andress, '06, is engaged in farming at North Amherst, Ohio.

W. L. Slate, who has been in school the past term, is now in Chicago working in a large manufacturing plant. Mr. Slate expects to return to school next fall and graduate in the '08 class.

S. N. Henkle, ex-'07, visited the University recently. Last November he was elected surveyor of Warren county.

E. D. Holl, graduate of '06, attended the meeting of the Ohio State Dairy Association.

J. Lyle, ex-'09, is farming near Flushing, O.

H. E. Ramsower, graduate '06, is taking work in the Engineering College.

Otto Eckman, graduate '04, is in the Government Soil Survey, and is now at Bastrop, Tex.

R. W. Harned, graduate '06, is an assistant in the Department of Entomology at the Mississippi Agricultural College.

Wm. Oates, ex-'08, is farming near Hepburn, O.

Frank Rubins, graduate '04, was in attendance at the meetings of the Live Stock Association.

Phosphoric Acid a Factor in Potato Production

In a discussion upon the need that potatoes have for a fertilizer, Prof. Greene said that in their experiments phosphoric acid had been the factor that determined the profit in the use of commercial fertilizers upon this crop. Being interested, a study was made and the evidence to support this is told somewhat briefly in this article.

In Ohio Bul. 1, Volume 3, we find this point first mentioned. Following this in Bul. 65, a more definite statement is made. It says, "Thus far in all of our experiments at Columbus, as well as here and at the branch stations, phosphoric acid has been the controlling factor in the increase of potato yields. It has not produced crops equal to a complete fertilizer, but while it alone has always shown a profit, the addition of the other elements has not always made the profits larger."

Director Thorne wrote in Bul. 110: "The tables show that there has been a marked increase in the yield of potatoes wherever phosphoric acid has been applied in the fertilizer and in the absence of phosphoric acid only a few cases where increases occurred, and then very insignificant." He gives a partial report in this bulletin, but in Bul. 125 the plan of the experiment and results are given more fully.

The series of plots are laid out in three tiers of thirty-four each, a three-year rotation of potatoes, wheat and

MAP SHOWING DISTRIBUTION BY COUNTIES OF AGRICULTURAL STUDENTS FROM 1900 TO 1906

clover is followed. "The soil is a sandy clay loam, clay predominating, but containing enough sand for the growth of an occasional chestnut, the forest growth being chiefly white oak." The slope of the plots is toward the south. The land is underdrained, the drains being thirty-six feet apart and thirty inches deep. The plots contain one-tenth acre each and every third plot is known as a "nothing plot," meaning that there is no fertilizer test upon these, they being used in computing results.

The results obtained on plots 2, 6 and 8 bring out the facts most forcibly. Seven crops had been harvested up to 1900. On plot 2 acid phosphate was sown each spring at planting time at the rate of 160 pounds per acre, the cost being $1.20 at the current prices for fertilizers. On plot 6, 160 pounds of acid phosphate and 80 pounds of nitrate of soda, costing $3.90, were sown. While on plot 8, 160 pounds of the acid of phosphate and 100 pounds of muriate of potash were used, at a cost of $2.60.

Now the seven year average of these plots was 167.5, 183 and 179 bushels, respectively. The average increase per acre on these plots over that of the "nothing plots" was 14.2 bushels for plot 2, 29.2 bu. for plot 6 and 25.6 for number 8. Computing the value of the potatoes at 33 1-3 cents per bushel, the average annual increase of plot 2 was $4.73, of plot 6, $9.74, and of plot 8 it was $8.54. Deducting the cost of the fertilizer as given above, we have an annual net gain from the use of these fertilizers of $3.53 per acre for plot 2, and with plot 6 an increase of $5.84, and with plot 8, $5.94.

These figures exceed by far those of any other fertilizer combination. The use of muriate of potash or of nitrate of soda alone actually resulted in a loss; however, the yield was increased somewhat but not enough to pay the cost of the fertilizer, with potatoes at such a price. The various complete fertilizer combinations gave large increased yields, but the first cost was so great that the profit was reduced to a minimum.

In summing up the figures given above the application of muriate of potash with acid phosphate, or of nitrate of soda with the phosphate has given a greater net gain than where the acid phosphate was used alone, the greatest advantage being in favor of the combination used on plot 8. However, the actual cost of the fertilizer per bushel of increase is the least on plot 2, where it amounts to only 9 cents.

The figures and results given in this article, it must be remembered, are for the years 1894 to 1900. It is hoped that the results of the last six years will be available so that further studies may be made upon this interesting question. But from these seven years it may be safely concluded that with the soil mentioned, the omission of phosphoric acid from the fertilizer, the profit will be greatly reduced if it does not disappear altogether. No mention has been made of the influence of the fertilizers to the wheat crop following nor has the effect those used upon the wheat been mentioned as having any bearing upon the potato yield.

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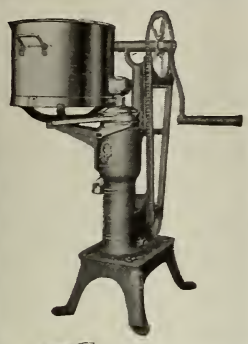

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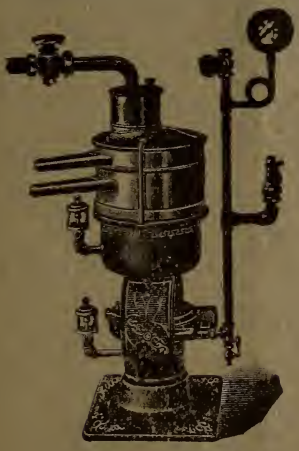

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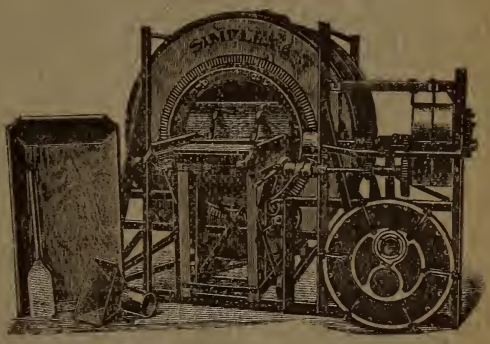

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